Al-Dhahir 2001-0207

IN THE CLAIMS:

1. (Cancel) .

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5. (Cancel) .

6. (Original) A receiver comprising:

a time-domain to frequency-domain converter responsive to a signal received by an antenna in frames k and k+1, for developing signals $\mathbf{Y}^k$ in frame k and signals $\mathbf{Y}^{k+1}$ in frame k+1;

a linear combiner for creating a first linear combination signal, $\tilde{\mathbf{Y}}^k$, from signals related to $\mathbf{Y}^k$ and $\mathbf{Y}^{k+1}$, and a second linear combination signal, $\tilde{\mathbf{Y}}^{k+1}$, from signals related to $\mathbf{Y}^k$ and $\mathbf{Y}^{k+1}$, where said first linear combination is different from said second linear combination;

an equalizer that pre-multiplies signal $\tilde{\mathbf{Y}}^k$ by a diagonal matrix **W** to form signal $\tilde{\mathbf{Z}}^k$, and pre-multiplies signal $\tilde{\mathbf{Y}}^{k+1}$ by said diagonal matrix **W** to form signal $\tilde{\mathbf{Z}}^{k+1}$;

a frequency-domain to time-domain converter for converting signals $\tilde{\mathbf{Z}}^k$ and $\tilde{\mathbf{Z}}^{k+1}$ to time-domain signals; and

a slicer responsive to said time domain signals.

7. (Original) The receiver of claim **6** where said time-domain to frequency-domain converter implements a Fast Fourier Transform algorithm.

8. (Original) The receiver of claim **6** where said frequency-domain to time-domain converter implements an inverse Fast Fourier Transform algorithm.

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9. **(Original)** The receiver of claim **6** where said linear combiner, in creating signal $\tilde{\mathbf{Y}}^k$ from component signals related to $\mathbf{Y}^k$ and $\mathbf{Y}^{k+1}$, multiplies at least one of said component signals by a diagonal matrix.

10. **(Original)** The receiver of claim **6** where said linear combiner, in creating signal $\tilde{\mathbf{Y}}^k$ from component signals related to $\mathbf{Y}^k$ and $\mathbf{Y}^{k+1}$, multiplies each of said component signals by a different diagonal matrix.

11. **(Original)** The receiver of claim **6** where said linear combiner, in creating signal $\tilde{\mathbf{Y}}^k$ from component signals related to $\mathbf{Y}^k$ and $\mathbf{Y}^{k+1}$, employs diagonal matrices Λ_1 and Λ_2 where diagonal matrix Λ_1 is related to characteristics of transmission medium between a first antenna of a transmitter of signals received by said receiver, and Λ_2 is related to characteristics of transmission medium between a first antenna of a transmitter of signals received by said receiver.

12. **(Original)** The receiver of claim **11** where said linear combiner, in creating signal $\tilde{\mathbf{Y}}^{k+1}$ from component signals related to $\mathbf{Y}^k$ and $\mathbf{Y}^{k+1}$, employs diagonal matrices that are related to said matrices Λ_1 and Λ_2 through operations taken from a set that includes negations and complex conjugations.

13. **(Original)** The receiver of claim **6** where said linear combiner creates signal $\tilde{\mathbf{Y}}^k = \Lambda_1^* \mathbf{Y}^k + \Lambda_2 \bar{\mathbf{Y}}^{k+1}$, and signal $\tilde{\mathbf{Y}}^{k+1} = \Lambda_2^* \mathbf{Y}^k - \Lambda_1 \bar{\mathbf{Y}}^{k+1}$, where $\bar{\mathbf{Y}}^{k+1}$ is a complex conjugate of $\mathbf{Y}^{k+1}$.

14. **(Original)** The receiver of claim **13** where elements of said diagonal matrix **W** are related to matrices Λ_1 and Λ_2.

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15. (Original) The receiver of claim **13** where said diagonal matrix **W** has elements

$$\mathbf{W}(i,i) = \frac{1}{\tilde{\Lambda}(i,i) + \frac{1}{SNR}}, \text{ where } \tilde{\Lambda}(i,i) = \Lambda_1(i,i)\Lambda_1^*(i,i) + \Lambda_2(i,i)\Lambda_2^*(i,i), \text{ and } (\cdot)^*$$

represents a complex conjugate operation, and *SNR* is a computed value.

16. (Original) A receiver comprising:

a time-domain to frequency-domain converter responsive to a signal received by an antenna in frames *k*, *k*+1, … *k*+m, where m is a selected integer greater than 0, for developing signals $\mathbf{Y}^k$, $\mathbf{Y}^{k+1}$, … $\mathbf{Y}^{k+m}$, in frames *k*, *k*+1, …*k*+m, respectively;

a linear combiner for creating signals $\tilde{\mathbf{Y}}^k$, $\tilde{\mathbf{Y}}^{k+1}$, … $\tilde{\mathbf{Y}}^{k+m}$ from linear combinations of signals related to $\mathbf{Y}^k$, $\mathbf{Y}^{k+1}$, … $\mathbf{Y}^{k+m}$;

an equalizer that pre-multiplies each signal $\tilde{\mathbf{Y}}^j$, *j*=*k*, *k*+1, … *k*+*m* by a diagonal matrix **W** to form signals $\tilde{\mathbf{Z}}^j$, *j*=*k*, *k*+1, … *k*+*m;*

a frequency-domain to time-domain converter for converting signals $\tilde{\mathbf{Z}}^j$ to time-domain signals; and

a slicer responsive to said time domain signals.

17. (Original) The receiver of claim **17** where said signals related to signals $\mathbf{Y}^k$, $\mathbf{Y}^{k+1}$, … $\mathbf{Y}^{k+m}$ are related to said signals $\mathbf{Y}^k$, $\mathbf{Y}^{k+1}$, … $\mathbf{Y}^{k+m}$ through operations from a set that includes negations and complex conjugations.

18. (Original) A receiver comprising:

p antennas, where *p* is an integer greater than 1;

a time-domain to frequency-domain converter responsive to a signal received by each of said antennas in frames *k*, *k*+1, … *k*+m, where m is a selected integer greater than 0, for developing signals $\mathbf{Y}_j^k$, $\mathbf{Y}_j^{k+1}$, … $\mathbf{Y}_j^{k+m}$, in frames *k*, *k*+1, …*k*+m, respectively, where subscript j identifies a j^{th} antennas of said *p* antennas;

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a linear combiner for creating groups of signals $\tilde{\mathbf{Y}}_n^k$, $\tilde{\mathbf{Y}}_n^{k+1}$, ... $\tilde{\mathbf{Y}}_n^{k+m}$ for each value of subscript j=1, 2, ... p, from linear combinations of signals related to said signals $\tilde{\mathbf{Y}}_n^k$, $\tilde{\mathbf{Y}}_n^{k+1}$, ... $\tilde{\mathbf{Y}}_n^{k+m}$, when n is an index designating a transmitting unit that supplies signals to said p antennas;

an equalizer that pre-multiplies each signal $\tilde{\mathbf{Y}}_n^q$, q=k, k+1, ... k+m by a diagonal matrix **W** to form signals $\tilde{\mathbf{Z}}_n^q$, q=k, k+1, ... k+m;

a frequency-domain to time-domain converter for converting signals $\tilde{\mathbf{Z}}_n^q$ to time-domain signals; and

a slicer responsive to said time domain signals.

19. (Original) The receiver of claim **18** where p=2, and where said linear combiner obtains signals $\tilde{\mathbf{Y}}_n^k$ and $\tilde{\mathbf{Y}}_n^{k+1}$ by computing

$$\begin{bmatrix} \hat{\mathbf{Y}}_1^k \\ \hat{\mathbf{Y}}_2^k \end{bmatrix} = \begin{bmatrix} \mathbf{I} & -\mathbf{\Lambda}_{2-1}\mathbf{\Lambda}_{1-2}^{-1} \\ -\mathbf{\Lambda}_{2-2}\mathbf{\Lambda}_{1-1}^{-1} & \mathbf{I} \end{bmatrix} \begin{bmatrix} \mathbf{Y}_1^k \\ \mathbf{Y}_2^k \end{bmatrix}$$

where $\hat{\mathbf{Y}}_1^k$ represents signal received at said receiver, in frame k, from transmitting unit 1, and $\hat{\mathbf{Y}}_2^k$ represents signal received at said receiver, in frame k, from transmitting unit 1, $\mathbf{\Lambda}_{1-1}$ is a diagonal matrix representing transmission medium between transmitting unit 1 and a first one of said two antennas, $\mathbf{\Lambda}_{2-1}$ is a diagonal matrix representing transmission medium between transmitting unit 2 and said first one of said two antennas $\mathbf{\Lambda}_{1-2}^{-1}$ is a diagonal matrix representing transmission medium between said transmitting unit 1 and a second one of said two antennas $\mathbf{\Lambda}_{2-2}$ is a diagonal matrix representing transmission medium between said transmitting unit 1 and said second one of said two antennas.

20. (Original) A method carried out in a receiver for decoding received frame signals of a unit that transmits over p antennas, comprising the steps of:

converting each received frame signal to frequency domain;

in groups of p consecutive converted frame signals, combining said converted frame signals to form p intermediate signals;

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multiplying said intermediate signals by values related to transfer characteristics between said p antennas and said receiver, to obtain thereby equalized signals;

converting said equalized signals to time domain, to obtain time domain estimate signals; and

carrying out a decision regarding information symbols transmitted by said unit, based on said estimate signals.

21. **(Original)** The method of claim **20** where said combining is linear combining.

22. **(Original)** The method of claim **20** where said transfer characteristics employed in said step of multiplying are frequency domain characteristics of transmission channel between said p antennas and said receiver.

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